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# Teachers College RECORD

A Journal Devoted to the Practical Problems of Elementary and Secondary Education and the Professional Training of Teachers

September, 1901

## SYLLABI OF COURSES IN ELEMENTARY AND APPLIED PSYCHOLOGY

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# Teachers College Record

**Edited by JAMES E. RUSSELL**

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| **No. 1 January** | *Biology in the Horace Mann High School.* — FRANCIS E. LLOYD and MAURICE A. BIGELOW. |
| **No. 2 March** | *Geography in the Horace Mann Schools.* — RICHARD E. DODGE and Miss C. B. KIRCHWEY. |
| **No. 3 May** | *Child Study.* — *Sources of Material and Syllabi of College Courses.* — Professor E. L. THORNDIKE. |
| **No. 4 September** | *Syllabi of Courses in Elementary and Applied Psychology.* — Professor E. L. THORNDIKE. |

**The following number in preparation:**

*The Economics of Manual Training.* — LOUIS ROUILLION. *This number will deal with the cost of the equipment and the maintenance of Manual Training, Domestic Art and Domestic Science in each of the grades and the high school.*

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**Columbia University, New York City**

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TEACHERS COLLEGE RECORD

VOL. II SEPTEMBER, 1901 NO. 4

# SYLLABI OF COURSES IN ELEMENTARY AND APPLIED PSYCHOLOGY

BY EDWARD L. THORNDIKE

Adjunct Professor of Genetic Psychology in Teachers College, Columbia University

(The courses described are subject to revision)

The purpose of this number of the RECORD is to give an account of the required courses in pure and applied psychology at the Teachers College. It comprises syllabi of two courses, the Elements of Psychology and the Applications of Psychology in Teaching. An outline of the course in Child Study (Education 9) was given in the RECORD for May, 1901 (Vol. II, No. 3), The two former are required of candidates for all diplomas, and together occupy three periods a week for a year. The course in Child Study is required of all candidates for the Elementary and Kindergarten Diplomas, and occupies two periods a week throughout the year. Normally, all three courses when taken by the same student are taken the same year.

These courses form the basis of the psychological side of the student's professional work, and are aimed to fit students for intelligent and efficient work as teachers. It is the policy of the department to give a thorough and scholarly introduction to the study of methods of teaching rather than a multitude of precepts and devices, or any cut-and-dried system of applied psychology. The superior training and mental calibre of college students should make them independent thinkers concerning methods of teaching throughout their professional careers, and

a good preparation for such thought will be better than any outfit of knowledge possibly presented in a single course. Moreover, these courses are followed by courses in general and special methods.

### ELEMENTARY PSYCHOLOGY (PSYCHOLOGY A)

Psychology A is a course in the scientific study of human nature and intelligence. It aims to preserve such breadth and rigor of treatment as fits a course for an academic degree and still to meet the peculiar wants of the prospective teacher. The latter end is attained by the selection of topics and by the use of illustrations from school life whenever possible. Semi-metaphysical questions, such as the nature of the self, the nature of knowledge, or the supra-phenomenal relation of mind and body, are entirely eliminated. Any detailed study of the physiology of the sense organs, of the relation of stimulus to sensation, or of the minute analysis of mental states into hypothetical elements, is dispensed with. Emphasis is laid upon the description of mental phenomena, an understanding of their neural basis, and especially upon mental life in function, upon mental states in action.

James' *Briefer Course* is used as a text-book, but a week is given at the beginning of the course to an introduction of the students to the general field of psychology by a simpler book, *The Human Nature Club,* and some topics in the course involve required readings in James' *Principles of Psychology.* The study of the texts is supplemented by class discussions and some additional topics are presented by the instructor.

#### SYLLABUS OF THE COURSE

1. The Aim of Psychology and the Nature of its Subject Matter. Thorndike: *Human Nature Club,* pp. 1-137.

2. The Common Technical Terms. (Presented by class discussions.)

> States of consciousness — sensations — percepts — mental imagery—memories—associations of ideas—individual notions—general notions—abstractions—feelings of relationship —judgments—impulses—emotions—æsthetic emotions.

3. The Physiological Basis of Mental Life. James: *Briefer Course,* p. 5, last paragraph to middle of p. 6. Lecture and demonstration.

Nerve cells—their function—nerves—afferent and efferent nerves—relex arc—localization of brain functions—associative fibres—inhibitory action—adaptability of the nervous system—law of habit as the general law of brain action.

4. Characteristics of Mental Life in General. James: *Briefer Course,* pp. 152-175, omitting last paragraph on 161 and 166 to middle of 167.

5. The Function of Mental Life. (Presented in class discussion.)

6. Unlearned Reactions or Instincts. James: *Principles of Psychology,* II., 383-402.

Nervous basis—growth into habits—inhibition of by disuse, by accompanying discomfort or substitution—variation in.

7. Learned Reactions. Ways of Learning. (Lecture and discussion.)

By selection of chance successes—by imitation—by ideas—factors involved in the last.

8. Sensations. James: *Briefer Course,* pp. 9 to middle of 17, 24-27.

Nature of—nervous basis—differences in—quality—intensity—range—delicacy of discrimination—defects—function.

9. Percepts. James: *Briefer Course,* pp. 312-326, 329-339.

Nature of—nervous basis—due to natural selection—illusions—hallucinations—factors involved in perception—the psychology of reading as an example of perception.

10. Apperception. *Human Nature Club,* pp. 57-64; James: *Briefer Course,* pp. 326-329.

Influence of general make-up of the mind—of particular spheres of thought—of what temporarily possesses the mind—nervous basis.

11. Attention. James: *Briefer Course,* pp. 217-237.

Nature—classification—nervous basis—function—feeling of effort in attention—qualities that secure attention—results of attention.

12. Imagery and Memories. James: *Briefer Course,* pp. 302-311, 287-301.

Types of—nervous basis—reproductive and productive—laws of memory—conditions of a good memory—improvement of memory.

13. The Order of our Thoughts. James: *Briefer Course,* pp. 253-279.

(A) Spontaneous and (B) controlled associations—classification of (A)—laws of—characteristics of (B)—relation to (A)—qualities of the efficient thinker.

14. Discrimination. James: *Briefer Course,* pp. 244-252.

Nature of—vagueness of primitive perceptions and ideas—conditions of discrimination of parts within wholes—of discrimination between objects or ideas—training in discrimination.

15. Reasoning. James: *Briefer Course,* pp. 239-243, 351-367.

Psychological factors of—feelings of relationship—feelings of meaning, individual, general, abstract—judgments—inferences—qualities of a good thinker—association by focal recall—comparison—selection.

16. Induction and Deduction.

The meanings of terms—logical aspect—psychological aspect—psychological factors and the validity of inductions and deductions—psychology of sources of error in.

17. The Emotions. James: *Briefer Course,* pp. 374-390.

Causation of—evidence—classification—genesis—function—æsthetic emotions.

18. Purposive Action. James: *Briefer Course,* pp. 415-455.

Conduct in terms of movement—classification of acts—instinctive acts—ways of modifying them. Purposive movements are secondary performances—ideo-motor action—association of movements with ideas, impulses, etc.—attention and purposive action—the feeling of effort—its significance. Theories of motives—types of action and decision—diseases of the will.

19. Automatic Action and Habit. James: *Briefer Course,* pp. 134-150.

Phenomena—causation—connection with purposive action—function—practical significance.

20. Suggestion.

Phenomena of—relation to ideo-motor action—analysis of.

21. The General Laws of Mental Action. Lecture.

22. Mental Training. *Human Nature Club,* pp. 170-180. Lecture.

At the end of the course a series of afternoon lectures are given presenting the results of special studies or dealing with general psychological questions not treated in the course. Attendance upon these lectures is voluntary. Their topics have been such as the following:

The Psychology of Temperament.
Mental Fatigue.
The Psychology of Interest.
Inheritance of Mental Traits.
Psychology and Philosophy.
The Mental Traits of Animals.
The Evolution of the Human Intellect.
The Mathematical Aspect of Psychology.
The Correlation of Mental Abilities.

## SUPPLEMENTARY NOTES

As a means of rendering permanent the results of those of the class discussions which supplement the text and of aiding students to comprehend the relationships of topics, typewritten notes on the various topics are from time to time given to the class. For 1900-1901 they were as follows:

2. The Common Technical Terms.

Psychology is the science which deals with *states* of *consciousness,* e. g., dreams, reveries, pleasures, pains, aches, emotions, memories, thoughts, sights, tastes, etc. Its business is to tell us

(1) what our thoughts and feelings are,

(2) how they come to be what they are,

(3) what causes make a person have certain thoughts and feelings rather than others,

(4) how our thoughts and feelings influence our bodily activities.

NOTE. Difference between feelings of things and things themselves. Explain by facts of dreams, hallucinations, different feelings caused in different people by same thing.

Our first duty is to familiarize ourselves with some of the facts, the phenomena, the data which we are to study and with the names given to these facts in books about psychology.

Touch yourself with a pencil.
Bend your finger.
Prick yourself with a pin.
Listen to the tap of a stick on the floor.

The feelings you have are called by psychologists *sensations.*

Look at a picture.
Listen to a melody.
Take hold of something with your eyes shut.

You feel in each case the feeling of some *thing* which is there. We call these feelings *percepts* or *perceptions.*

Imagine to yourself the tune of Yankee Doodle.
Imagine to yourself the feeling of velvet.
Imagine to yourself the sight of the Dewey Arch.
Imagine to yourself that your arm is swinging back and forth.

The feelings you have we call *mental imagery* or *mental images.* A mental image we may call the feeling of a thing or a sensation when it is really not there and is known not to be there.

Think what you were doing yesterday at one o'clock. Recall the feeling you have when you meet some one whom at first you don't remember but finally remember as having been with you at a certain place.

These feelings are what James calls "memory proper."

A child is asked, "What is the Latin for 'he loves'?" and replies, "Amat." Repeat to yourself any poetry that you know. You see a man and think of his name.

These feelings are cases of "associations of ideas," but are commonly called cases of memory.

We often also use the words memory and remember and forget for habits or matters of skill that are permanent. We remember how to dance, swim, play the piano, etc. Finally, we often call any mental image a *memory.*

If we have such thoughts as,

"Eggs are nutritious,"
"Girls are better than boys,"
"Electricity is not a fluid."
"All teachers should be paid,"
"Dewey is a hero,"

there may be images of sight, sound, etc., in connection with the thoughts, but they vary with different people, and are not the important thing in the thought. The important thing is the feeling of our *meaning.* Thus in the fourth thought, we feel that we mean *all* teachers, though we may have an

image of some one teacher, or of the sound of the word teacher, or of something different. These feelings of *meaning* are very important in all our higher sorts of thinking. When the feeling is that we mean every one of a class of things (e. g., "all teachers," or "girls") we call the feeling a *general notion* or *concept*. When we feel that we mean one particular thing (e. g., when we think "Napoleon," etc., or "this apple," etc.,) we call the feeling an *individual notion*.

We feel not only sensations, objects, meanings, but also the relations between them. For instance, if we look at two books, one of which is bigger than the other, we feel not only percepts of the books but also their relation of inequality. When we feel "cats *and* dogs" we not only have two general notions, but also the feelings that they are to be taken together. Very important among such feelings of relationship are those of likeness and difference. Try to observe in yourself the feelings you have when you think of *or, nevertheless, above, below, like, unlike, equal, unequal, the same as*.

The whole feelings we had in thinking the sentences given to show *meanings*, are called *judgments*. They are feelings of "is-ness" (to coin a word), feelings that may be expressed in declarative sentences.

Later on, a careful analysis will be made of our feelings of *meanings* and *relationships*, and of our *judgments*.

Put a small piece of blotting paper wet with acid on your forehead. Besides the sensations arising, you have a feeling which ordinarily would lead you to raise the hand to remove it; you feel, that is, a certain *impulse*. Recall the feelings which go with or just before coughing, yawning, raising your arm, etc.

When you next feel them, watch your feelings of indecision before acting, of decision, of desire, of bodily effort, of mental effort. See just how you feel when you do something, or think of doing it, when you "choose," when you "try."

When you next feel any one of the states commonly called joy, grief, anger, fear, hope, sympathy, try to see just what it feels like.

Watch your feelings (apart from the mere seeing, hearing, etc.) when looking at a beautiful picture, reading a novel, watching a play, hearing music. We call such feelings *aesthetic emotions*.

## 3. The Physiological Basis of Mental Life.

So far we have tried to get before us specimens of different sorts of mental facts and to acquaint ourselves with the names used for them by psychology. We have now to get a notion (a very rough and incomplete one) of the physiological or bodily facts which condition these mental facts.

Mental states, as we know them, depend upon brain-states. Different things happening in the nervous system or parts of it go with the different thoughts and feelings we have.

What, then, is the nervous system and what happens in it? The ner-

vous system is the sum total of nerve cells. Its action is the action of these nerve cells.

Recall demonstration of photographs and drawings of nerve cells.

Recall explanation of nerve cells as machines to conduct impulses or carry currents. Does the conduction run along smoothly or by a series of explosions?

A nerve is a bundle of long processes from a number of cells.

Recall the explanation of "*afferent*" and "*efferent*" nerves.

Recall the explanation of "*reflex arc.*"

Recall the explanation of "*localization of brain functions.*"

Recall the explanation of "*associative fibres.*"

Recall the explanation of "*inhibitory action.*"

## 4. Characteristics of Mental Life in General.

We have seen specimens of mental facts and obtained a rudimentary notion of what goes on in the brain. We shall now notice some general characteristics of all mental facts by reading pp. 152-175, omitting from p. 153 "*Every one will recognize*" to line 4 of p. 154, p. 161, second paragraph to p. 162, 12th. line, p. 166, 12th. line to middle of 167.

It is also convenient to think of mental states as,

(1) *attended to* or *not* (focal or marginal),

(2) *desirable* or *undesirable*,

(3) *clear* or *hazy*,

(4) *intense* or *weak*.

Give examples of mental states contrasting in these respects.

## 5. The Function of Mental Life.

We have now to see what mental states are for, what their business is in connection with human life in general, in scientific terms, what their function is.

We can best look on human life as a series of *reactions* to *situations*, a series which lasts as long as life lasts. By the word *situation* we express the fact that something happens to us and by the word *reaction* the fact that something happens in us or that we do something. Thus our stomachs react to the situation "pieces of food present" by pouring forth digestive fluids; our throat muscles react to the situation "something tasting good in the mouth" by swallowing; thus the baby reacts to the situation "sight of bright red paper" by grasping at it; thus the boy reacts to the situation "sound of a band playing" by running toward it; thus the pupil reacts to the teacher's words by taking notes. Now it is clear that our mental states influence very many of our reactions. One who has the mental state "memory that Jefferson was the third president" will react in one way to the question, "Who were the first three presidents?" One who has no such mental state will react differently (Give other examples.)

This is what mental states are for, to influence our bodily reactions to the situations or outward circumstances or environments in which we find ourselves. We found that the brain was a machine which provided

responses of the body to stimuli from outside. Consciousness, mental states go with the activity of parts of this machine and so mediate between situation and reaction.

We shall have to use the words situation and reaction very freely. Sometimes we shall mean the physical situation, sometimes the mental or psychological or felt situation. Thus let two persons be in the presence of a sound. The physical situation is air vibrating and is alike for both. The *felt* situation may be different according as one is asleep or awake, deaf or not, attentive or not. And there may be a mental or felt situation with no outside physical situation as its basis. E. g., The mental image of the motto "Don't worry" may cause one to relax his muscles and attention. The word reaction may mean the physical reaction, which will always be a movement of bone, muscle, glands, cells, etc., or it may mean a mental reaction; e. g., the presence of an idea of George Washington following upon the situation "hearing the words, 'First in war, first in peace,' etc."

Our main business will be to study the mental stuff composing and the conditions influencing the *felt* situations and the mental reactions, though we shall also have to know something about the physical reactions.

Now the process from situation to reaction is continuous, and it is only for convenience in description and discussion that we separate them. We really could not mark any point in the whole process, for instance, which takes place in the outer world and nervous system when we hear the cry "Fire" and run, and say, "This part was situation, this part was reaction, this part was mediation between them." Nor can we mark any point where the felt situation ceases and mental elaboration begins, or where mental elaboration ceases and mental reaction begins. The same mental stuff may be considered situation from one point of view and reaction from another; e. g., you hear a newsboy cry, "Horrible railway accident!" think of your brother who is travelling, feel anxiety, have the idea of buying the paper and do so. Your thought of your brother is your reaction to the sounds you hear, but serves also as part of the situation which brings the reaction "feeling of anxiety"; the latter again is also part of the situation bringing the reaction "thought of buying the paper."

## 6 and 7. Unlearned Reactions or Instincts. Methods of Learning.

Our reactions to most situations are the results of experience. We have learned what is the thing to do. But some reactions to some situations are made without any learning, are made because of the inherited structure of our nervous systems.

We shall call all these unlearned reactions, instincts, though it has been customary to call those which took place without consciousness reflex actions.

Examples are:

Situation: "being alone in the dark." Reaction: fear.

Situation: "feet on ground plus impulse to get somewhere." Reaction: walking.

Most of the things which we do we did not know how to do instinctively; we had to *learn* to do them. We learn to do things by

(1) *Trial and accidental success.*

Here our inherited make-up leads us to make in a certain situation a number of acts. If one of them brings satisfaction it is stamped in in connection with that situation so that it is more and more likely to be done. The acts which bring discomfort are stamped out. Recall the chick learning the way out of the pen, the baby learning to grab the bottle, the boy learning to fight.

The method is evidently one of selection of one act from many by reason of its success. The selection may be from not only instinctive acts but also acts previously learned.

(2) *Imitation.*

Here the sight of an act of another leads us to perform the act.

(2) may be combined with (1): e. g., in learning to pronounce a language.

(3) *Having ideas about the thing.*

In (1) and (2) there need be no definite ideas influencing our behavior at all. But in the majority of cases of human behavior we do things because we hear or see or remember or imagine or suppose or reason out something. E. g., Why did you come to Teachers College? Why does the boy say 500 when asked, "How much is 20 times 25?" Such reactions due to the presence of ideas are the chief possession of human beings as contrasted with the lower animals; a complete explanation of them requires us to study a number of different sorts of mental facts.

When we ask, "What mental factors determine our conduct in cases where we have learned to do things by thinking about them?", we find that they are chiefly our

previous experiences,
sensations and percepts,
attention,
images and memories,
feelings of meaning, judgments and reasonings.

All of these factors must therefore be studied.

## 8. Sensations.

The felt situations to which we react depend in the first place on our sensations. All our knowledge (and much of our activity) starts from sensations. We have already become acquainted with the bare facts, sensations. We have now to notice a few things about them. For lists of the different sorts of sensations, see Titchener, Outlines of Psychology, pp. 49-51.

It is clear that sensations differ one from another. Complexes of sensations (e. g., the sights of two different neckties, the sounds of two different chords), differ because they are made up of different elements. Elementary sensations have (1) differences corresponding to differences in the end-organs concerned: e. g., hunger vs. red, cold vs. sounds, pressures vs. tastes. There are also (2) differences of quality between sensations from the same sense: e. g., red vs. green, note C vs. note E. There are also (3) peculiar qualititive differences (which seem differences of more or less of a certain thing) which we call differences of *intensity:* e. g., bright vs. dim light, a loud vs. a soft note. Further differences we cannot take time to discuss in this course, but see Titchener 52-75.

The limits high and low to the number of air vibrations, ether vibrations, etc., which cause sensations vary with different people and different circumstances: e. g., old people in general do not hear some very high notes which young people in general do hear. The distance between these limits is called the *range* of sensations for any person at any time.

Not all differences in the physical stimuli are felt as differences in sensations. A certain amount of difference has to be reached before any difference is *felt.* (Recall class experiments.) Further, the same amount of difference, which, when added to one stimulus, causes a feeling of the difference, may not cause such feeling when added to a stronger stimulus: e. g., two lines 16 inches and 16 1-8 inches will not be felt to differ, though two lines 1-4 and 3-8 inches in the same circumstances will. Ability to notice correctly differences between sensations is called *sense-discrimination.*

## 9. Percepts.

Recall examples and definitions from earlier lessons. James should furnish answers to the questions:

(1) What is the brain-action which goes with perception?
(2) What determines what "thing" shall be felt when certain sensation-processes are present?
(3) What is an illusion? What brain-action goes with such a feeling?
(4) What are some different types of illusions?
(5) Are the mistakes in our illusions due to bad action of the senses or bad interpretation?
(6) What is the difference between sensations and percepts?
(7) Is the feeling of a thing made up of a lot of feelings of its different parts?
(8) What are the causes of illusions?

Although our felt situations depend for their constitution on sense powers, yet what we feel is generally not mere color or sound or taste, but rather things, objects. The nervous process caused by the activity of a sense-organ arouses in the brain (which has had previous experiences of a similar nature) connected processes, and both together give rise to the

"feeling of a thing" which we call a percept. Percepts are thus very important factors in our situations, and the felt situation depends on them as well as on the senses. Recall demonstration in class of different things being felt from just the same sense stimulation.

An illusion is the feeling of a thing when it is *not* there, but something else is, which we mistake for it.

An hallucination is the feeling of a thing when it is *not* there and nothing else is.

There is no hard and fast line between percept, illusion and hallucination; every percept is partly illusion. The process in each case is the same; the difference is in the way it is caused. Ordinary perception (e. g., hearing a conversation or reading a book) is a mixture of percept and illusion.

## 10. Apperception.

We have seen that the felt situations and the reactions to them depend on the sensations and percepts aroused, that therefore the condition of the sense-organs is an important factor. But the feelings aroused do not depend entirely on the stimulus given, but also on the condition of the mind which reacts to it.

(1) Recall cases where the different previous experiences of two or more people make differences in the way they feel the same stimulus: e. g., a musician and an ordinary person at a concert.

(2) Recall cases where the different present thoughts of people make differences in the feelings they have at the same stimulus.

It may be the general condition of the mind, or it may be only the condition of some particular sphere of consciousness which is thus influential. Thus (to give an instance of the latter) the reaction a person makes to the words "Fermez la porte," is uninfluenced by the presence or absence of experiences of lions, or knowledge of Greek, or the belief in ghosts, but is decidedly dependent on the presence or absence of a knowledge of French.

This general fact that the effect of any stimulus depends on what mental content is already present has been called "apperception" by pedagogical theorists. The particular systems of ideas, spheres of consciousness, contents concerned have been called "apperceptive masses." In common-sense English the fact is that what we think and feel and do at any time depends on what we *have* thought and felt and done in the past. The real reason for it we saw when studying the nervous system. It was that the nervous system was a machine which was changed by everything that happened to it and by everything it did.

## 11. Attention.

We have seen how our felt situations are conditioned by the condition of our sense-organs, our powers of discrimination and our whole mental make-up and previous experiences. They are further conditioned by the degree to which they are focal in consciousness. A person may have

good ears and a knowledge of the French language, but unless he is attending to you, your words "Fermez la fenêtre" will not influence him. One of the most important differences in our feelings is between those attended to and those not. Recall examples.

James' chapter should answer for you:

(1) Are our feelings always either focal or marginal or may we have at one time all the objects of our thoughts equally prominent?
(2) What are some cases nearly in the latter state?
(3) In what different ways would you classify attention?
(4) Explain each classification: i. e., tell in each case just what are the differences between the different sorts of attention. See pp. 221-225. In *Principles,* 416-424.
(5) How do we ordinarily attend during an hour's hard study?
(6) What happens in the brain when we attend?
(7) What are our reasons for believing that these events (mentioned in the answer to the last question) happen? pp. 229-236 are all on this point. In *Principles,* pp. 434-446.

Think up examples of every fact you read about in this chapter.

Some results of attention are that situations which are attended to are more likely to be assimilated, discriminated, remembered, understood.

Some qualities in a stimulus or situation which gain immediate attention are

(1) Intensity,
(2) Clearness,
(3) Novelty (but with
(4) sufficient *familiarity* to be assimilated),
(5) Pleasurableness, and
(6) Expectation on the part of the person.

It will pay to think of examples from school life or elsewhere of attention gained by reason of each of these qualities, and of failure to gain attention due to their absence. Think also how far it is wise to use each of these qualities.

*Inattention* may be due either to

(a) attention to something else,
(b) general scatterbrainedness.

## 12. Imagery and Memories.

Examine some of your own images of sounds, tastes, movements, sights, etc.

Pages 302-310, *Principles;* II, 50-68, are descriptions of these various sorts of imagery.

Pages 310-311, *Principles;* II, 68-75, give an account of the brain processes which may be supposed to cause them, viz:—

(1) Nerve action in a special part of the brain, or
(2) Nerve action in the same part of the brain as was concerned in the real experience, but of a less intense sort, or
(3) Nerve action in the same part plus differing associated action.

Remember that such images are commonly called memories.

PRODUCTIVE IMAGINATION

What is the difference between it and the foregoing?
How are such images caused?

MEMORY

Just what does James mean by memory? See p. 287-288. *Principles* 648-652.
What are the causes of any such memory feeling? See p. 289-292. *Principles* 653-659.
What then makes a person likely to remember successfully?
(Note that here James is thinking of associative memory as well as personal memory).
How far can one improve one's memory?

## 13. The Order of Our Thoughts.

### A. SPONTANEOUS THINKING

James tries to answer three main questions, viz:

(1) What determines the order of our thoughts?
(2) How shall the different sorts of association be classified?
(3) Supposing an obect to have been associated with several others, which of them will it call up?

He answers (1) on pages 256-258. *Principles* 552-557, 561-569. Recall also what was said about accident (see p. 278) and sense-impressions.

He answers (2) by classifying associations according to how much of the first thought is at work in calling up the second. We have thus:

(a) total recall, pp. 259-261. *Principles* 569-571.
(b) partial recall, pp. 261-263. *Principles* 571-574.
(c) focalized recall, pp. 267-269. *Principles* 578-580.

He answers (3) on pp. 264-267. *Principles* 574-577. It will call up, he says, the one which is its

most recent associate,
most vivid associate,
most habitual associate,
most congruous associate.

We might add that it will, other things being equal, call up an idea that belongs to the same mental system. One's mental life is really a

complex of a lot of different lives or systems or attitudes: e. g., one's school system of thoughts, one's home system, one's system with one's intimates, one's society system. When one's mind is, so to speak, tuned to one of these ways of thinking, any idea that comes up will be likely to call up some idea that accords with that system. Recall and think of illustrations.

Some other questions answered in this chapter are:

(1) What element in any object will count most, be most prepotent in calling to mind other objects? See pp. 262-263. *Principles* p. 572.

(2) Does being similar cause ideas to be associated? See p. 268, last half. *Principles* p. 579.

(3) What really happens when we have a so-called association by similarity?

### B. Voluntary Thinking

Voluntary thinking is spontaneous thinking plus the selection of the ideas which fit. The good thinker is, then, the one (1) whose mind is fertile, has many ideas, (2) who sees which fit and picks those out, and (3) keeps his attention on them, paying no regard to non-essentials.

## 14. Discrimination.

James' chapter on Discrimination should answer for you the following questions:

What facts do we mean by the word "discrimination"?

Do we naturally feel a complex thing as a complex of various elements or characteristics or as a vague whole?

How do we come to feel the differences between any two things or situations? i. e., What conditions have to be fulfilled in order that we may feel their difference?

Just how does each one of these conditions work? pp. 245-248. In *Principles*, 494-502.

How do we come to feel the elements of a complex thing? 248-251. In *Principles* 502-508.

How do we perfect our powers of discrimination?

## 15. Reasoning.

We have now to study the feelings which we have when we understand things, reason about them, think concerning them. The study of logic tells us how we think when we think rightly; psychology tells how we think whether we think rightly or wrongly, understand or misunderstand.

At the beginning of the course we noticed as common mental facts (1) feelings of meaning or reference, (2) of judgments. These are the important feelings concerned in comprehension. Very many of our sen-

sations and percepts and images and memories are turned at once into judgments: e. g., a note is struck on the piano and we feel not the bare sound but rather the thought or judgment, "I hear the note C on a piano." We look at a line and an image of the word "straight" comes to our mind, but is turned at once into a judgment, "That line is straight," etc., etc.

James' chapter on Conception tells about our feelings of the meaning or reference of our thoughts; the chapter on Reasoning tells how our judgments combine to make "reasonings" and what the essentials of successful reasoning are.

In particular the chapter on Conception tells us:

(1) That we can refer to or mean the same thing though the mental states involved be different. (Illustrate.)

(2) That we can mean

(a) a class of objects (concept, universal, general notion),

(b) a particular object (individual notion),

(c) an abstract quality (abstraction),

(d) a thing which doesn't even exist.

Each of these sorts of meanings is important in different sorts of thinking: e. g., mass, velocity, acceleration, etc., in physics are abstractions; line, angle, circle in geometry are universals; Cæsar, Cicero, Washington, New York, the Mississippi River are particulars; the fourth dimension, lines of infinite length, a machine to turn the potential energy of coal directly into electrical energy, are "problematic objects."

In the chapter on Reasoning, James tells us:

(1) That the mere course of our ideas following the laws of association often brings us to correct results: e. g., we thus know that night will follow to-day;

(2) but that we often think out problems which we have never met before and couldn't answer by mere association: e. g., how to bridge the East River.

(3) We do this:

(a) By being able to think the *elements,* or *properties,* or *facts about* the situation confronting us;

(b) by being able to think of the consequences of those facts. Illustrate these two powers.

What names does James give to these two abilities?

(4) To reason successfully then we must be able to *pick out* the element or characteristic or fact about the situation which it will be useful to know in the particular case we are dealing with. We must also be able to *compare* things, to catch vital, important similarities so that we can tell something about a thing from our knowledge of things like it. *Selection* and *comparison* are good names for these two sorts of thinking.

James should also help you to answer the questions:

(1) Why is association by similarity generally frequent in good reasoners?

(2) Are there any properties or elements which are the real, true being of a thing (e. g., of a potato), which are *the* essentials of a potato?

Tell just what happens when a person thinks thus:

This man has a broken neck, therefore he will die.

## 17. The Emotions.

Read again pp. 370-372.

Certain objects, circumstances and ideas do cause in us emotional feelings. They also clearly cause certain conditions or affections of our bodies, particularly of our internal organs or viscera and of our circulatory system.

The James-Lange theory of the emotions says that at least in large measure they *are* the *feelings of these bodily conditions.* Just as we see when our retinas are stimulated, so we feel fear, joy, jealousy, etc., when the sensory nerves coming from our hearts, stomach, chest, etc., etc., are stimulated by various conditions of those organs. See pp. 375-376. *Principles* 442-451.

### The Evidence.

(1) There may be such conditions or affections of the bodily organs before the emotional feeling comes. See pp. 376-377. *Principles* p. 457.

(2) Such conditions are felt and if we attend to our emotions we can resolve them at least partly into definite bodily feelings. p. 378. *Principles* 451.

(3) If we do so resolve the emotion into such components and then imagine it without them, it is no longer emotional. p. 379-380. *Principles* 451-453.

If such be the causes of our emotions it is foolish to try to classify them. For they will vary indefinitely. p. 381; p. 374. *Principles* 453-454.

For the source and growth or the genesis of our emotions, see pp. 386-390. *Principles* 477-485.

## 18. Purposive Action.

Our first question is: "How do we come to make the movements that we do?"

If we examine the following list of acts (each due of course to movements, contractions of some muscles) we see that they fall into groups as shown by the figures:

1. Swallowing
2. walking
3. writing

1.2. laughing

3. playing tennis

1.2. crying

3. putting on one's hat

2. reaching for things

1. breathing
1. sneezing
1. the knee jerk
1. blushing

3. talking.

We have classified them roughly according to the way that we come to perform them.

(1) Acts like those numbered 1 we can perform in general (a) without having had to gradually acquire them, (b) without any act of volition: i. e., without definitely willing to do them. Further they are (c) not easily modifiable: i. e., we cannot easily change or abolish them. The name "reflexes" applies roughly to such acts. They are in short (1) unlearned, (2) involuntary, (3) not easily modifiable.

(2) Acts like those numbered 2 are also unlearned and may happen apart from any attention to do them, but they are modifiable, may be inhibited or confirmed. The name instinctive acts applies roughly to them, but there is no hard and fast line between acts of the (1) and (2) classes.

(3) Acts like those numbered 3 differ from (1) and (2) in being acquired by experience, learned and being primarily voluntary, intended, willed acts, though they may become automatic.

For an account of acts of the (1) group, see any standard physiology.

For an account of acts of the (2) group, see James, pp. 391-400. *Principles* 383-385, 403-441.

The important questions are:

Why do we do these things without having to learn them?
How do we modify them?

e. g., By confirming such impulses by habit.
By inhibiting such impulses by painful consequences.
By inhibiting such impulses by other contradictory impulses.
By inhibiting such impulses by forming the habit of dealing with a situation in some other way.
By losing them by mere failure to exercise them.

Recall examples of instincts modified in each one of these ways.

For an account of acts of the (3) group, see pp. 415-428, and the following notes. *Principles* 486-493 and 518-530.

We have found that our nervous systems are so organized as a result of heredity that we make certain movements in certain situations without intending or deciding to make them, without foreseeing them or their consequences. Let us remember too that we make some random movements by accident, because of accidental changes in the activity of the nervous system. It is also possible that we are so organized that we tend to make certain movements when we see them made, that is, to act at times from mere imitation. All this without any foreseeing or intending: i. e., without willing.

Only movements thus made without volition, can later be made as a result of will. See James 415-416. *Principles* 487-488.

How does this control by the will come about?

The impulse to any movement made is associated with a number of ideas. The impulse to a movement comes in connection with sights, sounds, thoughts of all sorts; the movement itself brings feelings of movement in the part moved, of its position, of the things it may touch, of its appearance to the eye, etc. It also results in more indirect consequences: e. g., we write a, b, c, and feel not only such sensations as have been just described but also the sight of the letters on the paper.

Impulses and consequently movements thus become associates of certain ideas and may be called up just as other ideas are, by the ordinary laws of association. We can then control these movements because we can control our ideas. We get a movement by bringing up some idea which leads to it, and our feeling of intending or willing to do a thing is our feeling of having such an idea, attending to it and allowing it to prevail and result in its appropriate movement. This is the gist of 417-428.

James defends and explains this view by saying:

(1) We need not have any feeling of "innervation," of how much nervous discharge there is. pp. 418-419.

(2) The feeling of "let it occur," "fiat," is alike in all sorts of movements willed, (419) and

(3) This "fiat," decision, determination, willing is not necessarily present. The mere thought of a movement tends of itself to bring the movement to pass. pp. 423-428. *Principles* 522-528.

(4) Our control over our movements is then not over them directly, but over them by means of our control of the ideas which serve as "motor-cues," and this control occurs by means of attention. p. 448-449. *Principles,* from bottom of 559 to top of 565. (Read very carefully).

(5) Our feeling of effort when we determine or decide or will to do something is not a feeling of some peculiar thing, "the will," doing something, but is the same feeling of effort that we get when we voluntarily attend to any idea. In this case the idea is an idea which leads to a movement and so we commonly call the effort "an effort of will" or a feeling of the exercise of our will power. It is, however, just the feeling which goes with attention. 450-455. *Principles* 565-567.

(6) Obstacles, oppositions which prevent our willing a certain thing, are then just oppositions which prevent our attending solely to a certain idea and letting it possess us.

### The Philosophy of the Will

James says (pp. 458-460 and 455-458, *Principles* 569-579), that we feel as if we really were not wholly the result of heredity and circumstances, but really counted in the world, really made a difference, and that this is the highest of our accomplishments, the most serious thing in our life. It seems as if we could have attended otherwise than we did.

But, he adds, psychological science can prove neither this nor the opposite theory, and for ordinary purposes it is better to assume, as we all in fact do, that people's actions are controlled by causes and vary with their inherited traits, education, etc.: i. e., are not the result of unknown principles.

One theory has been that all our acts were caused by actual or imagined pleasurable or painful consequences. On p. 444-448 (*Principles* 549-559) James argues against this view by showing:

(1) That those of our acts which we call expressions of emotion are not so caused;

(2) that many habitual acts are not;

(3) that we often act directly contrary to the dictates of pleasure because an idea somehow possesses us.

### Types of Will

When we will something deliberately we generally have a feeling of indecision followed by one of decision.

On pp. 428-429 James tells what these feelings are really made up of. He then, pp. 429-434 (*Principles* 531-535) describes some different types of decision.

The healthy-minded person decides promptly after thinking over the proper associations, and has to reinforce abstract, ideal considerations, in order to counterbalance the force of instinctive preference, pleasure and pain, or habit. See pp. 435-436. *Principles* p. 536.

An unhealthy will may be shown in:

(1) Deciding without thinking over the situation, or

(2) misplaced inhibition, or

(3) misplaced impulsion.

If we have not enough inhibition, see 437-439, we may act too readily. So also if we have too much impulsion toward some particular acts. See 439-440. Both things result in the so-called "explosive will." The "obstructed will," due to too much inhibition or too little impulsion, is described on pp. 441-442. In the *Principles,* see pp. 537-549.

## APPLICATIONS OF PSYCHOLOGY IN TEACHING (EDUCATION 3)

The aim of this course is not so much to teach students applied psychology, as to teach them to apply psychology. It seeks to establish in them the habit of using knowledge of the facts of mental life to guide their thought about teaching and of applying general principles of method to particular problems in school life with intelligent caution and with constant appreciation of the limiting conditions of class-room work. To insure that the students themselves realize the derivation of precepts of method from facts of psychology, this part of the course consists in great measure of questions to be answered by each student independently on the basis of the previous work of the class. These answers are discussed, compared and explained in the recitation periods. Two systematic text-books of method are also studied. In order that students shall keep before their minds the actual conditions of class-room instruction and the actual nature of a teacher's work and so make their work in the course relevant to real needs, they are required to spend twenty hours in the school, to make a collection of material which they think would be helpful in school work, to examine and criticize lessons chosen from various text-books, to make out plans for lessons, study hours, home work and excursions, and to answer a variety of practical questions taken from actual school life. Inasmuch as personality is the chief factor in class management, a part of the course will deal with the means of cultivating those personal traits which determine a teacher's efficiency.

The outline that follows includes a list of the topics of the course with references to the previous readings in psychology, samples of the questions set the students and brief summaries of the additional discussions, and a description of the practical work required.

One section of the class in Education 3 is composed entirely of prospective teachers of fine arts, manual training, and domestic

art and science. This section will substitute for parts of the work here described a study of those applications of the psychology of sensation, movement and æsthetics to teaching which are especially relevant to their professional needs. Their practical work in observation, study and construction of lesson plans, etc., will also be differentiated from that of the other sections.

## SYLLABUS OF THE COURSE

1. General Introduction. *Talks to Teachers,* pp. 3-14, 22-32; *Human Nature Club,* pp. 42-46. *Syllabus,* pp. 8 and 9.

If we describe the fact of life as a series of physical and mental reactions to various situations, how should we describe the work of the teacher? Do the reactions which children make to what they see and hear and read come by accident or caprice, or do they follow regular laws? Is good teaching a matter of luck or guess-work or miracle, or a thing that can be understood and controlled? What are the differences between the reactions which children make to what happens to them and the reactions of iron to the magnet, a metal to an acid, the stomach to food?

What are some of the important limiting conditions to children's reactions which are due to the customary organization of schools? Which would be easier to bring about, some desired reaction in one boy or in twenty-five children in a grade? Why?

Would you expect Psychology to furnish a set of definite rules for teaching particular subjects to particular children? Would you expect that you could find in it knowledge that would turn you from a bad to a good teacher? Would you expect that it might suggest changes in your ways of teaching that you could then test by actual trial; that it would prepare you to observe the actual workings of children's minds so as to get an unconscious appreciation of how to influence them? What else would aid you?

> Teaching defined in psychological terms—the application of psychology to it—limitations of such application—individual differences—hereditary capacities—subtle personal traits in the teacher—their cultivation.

2. Plan of Work.

What are the factors that cause our reactions to our surroundings? Suppose you wished to apply what could be known about these factors from psychology to the problems concerning

their use in school work, in what order would you take them up? Pick out three or four of the most important for school work. Which ones does James discuss (in his "Talks to Teachers")? Fitch? McMurry? (Look at table of contents in each case.)

3. Means of Receiving Stimuli and Reacting to Them. *Human Nature Club,* pp. 10-15.

Can you teach anything to a child who has no sense organs? Name three common sense defects in school children. What measures would you take to make your teaching effective in spite of each of these defects? Would the mere knowledge of the existence of the defect help your teaching if you did nothing about it? Do you think that the voice that you ordinarily use in class discussions is suitable to class teaching? What simple precepts about teacher's work do you derive from the fact that to react to a stimulus, children must see or hear or feel it?

By means of what apparatus does a child react to his environment? Is this apparatus alike in all children? In the same child at all ages? What features of school work depend largely upon it?

4. General Mental Functions. *Human Nature Club,* Chapters II and III. *Syllabus,* pp. 9 and 10.

Do we have to teach children everything they learn? Do we have to cultivate in them all the interests they come to possess? Can we direct their attention as we will? How do the facts on which you base your answers to these questions limit the teacher's influence? How may they be made to assist it?

Recall the facts concerning the three chief processes of learning: by the selection of chance successes, by imitation, and by gaining ideas. If in learning to write legibly the child improves by the gradual strengthening of those impulses which give him pleasure and by the weakening of those which give him discomfort, the teacher should naturally seek to make the child feel pleased when he writes well, and uncomfortable when he writes badly. Which is oftenest done? Which is the more efficacious? Which is better, to praise or rebuke the child for his writing at the end of a period, or at the very moment he is writing? Why does mere repetition of itself fail to make one improve? What is necessary in order that it shall be profitable to "try, try again"? Do teachers ever err in trying to teach by explanation what can be learned only by the selection of successes? Give instances. Give

instances of other mistakes due to trying to have children learn in one way what can only be learned in one of the others.

Name a number of things learned in school by imitation. What obvious precepts would you derive concerning the teacher's voice, accent, dress, handwriting, nervous mannerisms? What other important features in the teacher's make-up are likely to be imitated? Has the psychology of imitation any bearing on problems of discipline?

What are the chief factors involved in learning by ideas? In applying your knowledge about them to problems of teaching, what order would you follow? Why?

5. Apperception. *Human Nature Club,* Chapter V; *Syllabus,* p. 12; *Notes on Child Study,* Section 8.

If the effect of any stimulus depends not only upon its nature but also on the condition of the minds that receive it, we must evidently fit our teaching to the children we teach. Nothing can be taught them until they have a mental content that can assimilate it. How would you allow for this fact in planning a course of study? In planning a lesson? How would this fact help to explain the advantages of a regular teacher over a substitute? Would it offer any evidence that time spent in review would often be saved later? What difference would there be between two teachers of history, one of whom at each lesson retraced certain features of the last lessons, the other of whom began by making some statement in advance? Which features should be thus retraced, if any? Should this always be done in every lesson? Should the teacher always make sure that her statements will be understood and appreciated at the time she makes them? What would you take to be the meaning of this: "Each lesson or series of lessons should be an apperceptive whole"? From the point of view of this discussion, what might be the value of telling the class, at the beginning of a lesson, what you were going to try to teach them?

6. Attention. *Briefer Course,* pp. 217-236; *Notes on Child Study,* Section 9.

Bearing in mind what qualities in stimuli attract immediate attention, what precepts would you derive concerning the presentation of facts to children in text-books, lectures, recitations, etc.? Do you see why the newspapers use caricatures so much? Why

might it be bad teaching to have one regular plan for teaching a subject? Why would the liking of pupils for a teacher make them attend better? How might a pleasant schoolroom make pupils more attentive to their teacher? How might it make them less so? Is there any foundation in the psychology of attention for the belief that the aim of the work he is doing should be present in the mind of the scholar? What special devices have you seen used to gain and hold immediate attention?

Attention to certain things involves inattention to others. Distracting objects and events and occupations must naturally be avoided. How might the teacher herself serve to distract attention from what she is trying to teach?

Is there such a thing as general inattention, attention to nothing?

When we cannot get attention to stimuli because of their own intrinsic attractiveness, we must derive it from some external motive. What are some of the common motives used? Which of them do you consider the best? Which do you consider quite unjustifiable? Do you see any danger in appealing to children's liking for you to gain their attention to something intrinsically unattractive; in rewarding them with prizes, favors, etc.? Should a teacher expect the same motive to influence all those in her class? How can a teacher use tact and judgment in the motives to which she appeals?

The general question of what motives to use in leading children to do mental work will come up under "Incentives and Deterrents."

Nature of attention—results—means of attaining—samples of their proper and improper use—summary of class discussion.

7. The Association of Ideas.

The basis of purposive thinking—types of individuals in regard to—forgotten knowledge may still influence—relation to apperception—questioning as a means of calling up proper associations—misuse of questioning—mistakes due to vague associations—to the wrong element of the first idea being prepotent.

8. Comprehension, Reasoning, Logical and Abstract Thinking. *Briefer Course,* pp. 239-243, 351-367; *Human Nature Club,* pp. 108-110; *Syllabus,* pp. 15 and 16; *Notes on Child Study,* Section 13.

When any desired reaction depends upon feelings of the meanings of terms or propositions, we say commonly that the scholar must not only sense the stimulus and attend to it and have previous experience enabling him to assimilate it, but must also comprehend it or understand it or reason it out or see through it. In such cases (1) general notions, or notions of classes of objects and (2) general judgments, or judgments about classes of objects and (3) abstract ideas and (4) judgments concerning abstract qualities are very frequently present.

The appreciation of these, like the appreciation of sensations or percepts, is due in part to suitable previous experience. The existence of suitable mental content is one essential of the comprehension of rational trains of thought, and our discussion of apperception should therefore be borne in mind here. But people of similar previous experiences and present knowledge may differ in their powers to reason or understand abstract or general statements. Other processes then are involved.

Most thinkers about applied psychology have regarded only two of the simpler processes involved in reasoning things out, induction and deduction. By induction is meant the process of arriving at some general idea, or idea of a class of things, by the consideration of a number of individual things, or the process of arriving at some general judgment, or judgment about a class of facts, by the consideration of a number of individual facts. Thus the boy who considers an oak, an elm, a birch, etc., comes to have an idea of a tree in general. Thus the scholar who considers the action of sulphuric, hydrochloric and nitric acids, etc., on zinc, lead, and sodium, etc., arrives at the general judgment that acids dissolve metals. We take individuals that represent a class, notice something about them, and then affirm it of the class to which they belong. The validity of the process depends, of course, upon the representative quality of the individual facts we consider.

Corresponding to this process we have so-called inductive methods. What would be an inductive method of teaching a class to understand the meaning of "noun" and "verb"; that four threes make twelve; of teaching French or Latin; of teaching that the three angles of a triangle are equal to two right angles; that $-9$ times $-3$ gave $+27$? Is all comprehensible knowledge the result of induction?

Inductive methods of teaching will be discussed later in the course.

By deduction is meant the process of arriving at some judgment concerning a thing by virtue of knowledge concerning the properties of the general class to which it belongs. Thus a boy who knew of a word only that it was a noun could judge that it could be the subject of a sentence, could have adjectives for modifiers, etc., etc. Induction is often described as going from particular facts to general, deduction as going from general facts to particulars.

What would be a deductive method of teaching French or Latin? What grammar school subjects involve most deductive reasoning? What high school subjects?

Good teaching by inductive methods depends upon a clear statement of the goal aimed at, the selection of enough and representative individual facts, their arrangement in such a way as to make the general idea or judgment they lead to obvious, and the reinforcement and clarification of the general idea or judgment, when obtained, by applying it to new individual facts.

Good teaching by deductive methods depends upon a clear statement of the goal aimed at, independent search by pupils for the proper class under which to think of the thing in question, criticism by them and by the teacher of the different classes suggested, and appreciation of the reasons why the right one is the right one.

The psychology of the processes, other than correct induction and deduction, on which the accurate feelings of meanings and judgments and adroit inferences that constitute comprehension depend, is not well worked out, and we can only apply certain rather vague principles. Could a person reason well or follow intelligently a train of reasoning about a class of objects if his knowledge of the individual members of the class were imperfect? Could a person comprehend statements about a quality, say bivalence, if he did not know the essentials of that quality? Would he comprehend the answer to a question better if he were first made to realize the question? Why? If the habit of comparing things and the ability to see the essential elements in a thing and ready knowledge of the properties of these elements are the characteristics of the good reasoner, what sort of teaching would make students reason well? In which case would a student be the more likely to comprehend a theory or argument, if he had his knowledge in the form of images, for instance of a leaf of certain

shape, or if he had it in the form of a judgment that the leaf was of that shape? Would any of the qualities efficacious in gaining attention be also efficacious in gaining comprehension? If an adequate general notion, e. g., of a verb, requires that the essential similarities of the different individual things referred to be appreciated, should one example or many be given with the definition? If all judgments refer eventually to real objects, will it be generally safe to trust that judgments can be comprehended without actual demonstrations, experiments and objects lessons?

> Mental factors involved in rational thought—induction—precepts concerning—deduction—precepts concerning—importance of data in reasoning—value of feeling questions to be answered—comparison—precepts concerning—selection—precepts concerning—clearness and arrangement—precepts concerning.

The processes by which people think things out often cannot be followed at all. To some people the right idea simply comes, they know not whence or how. We say that such possess tact or scientific insight or instinctive business ability or what not, but we cannot give their rationale.

To all outside appearances such people simply guess, but they guess right. The essential element is picked out automatically. The idea that comes without any rational procedure is still the one that fits the situation. If you defined this general feeling for the truth of things as the power to guess right, how would you try to cultivate it in a scholar? Do teachers customarily encourage children to guess? When has any one a right to guess?

Read James: *Talks to Teachers;* pp. 33-37.

We have already seen that knowledge in the form of definite judgments is superior to knowledge in the form of hazy images, that recalling ideas from within is better than repeatedly receiving them from outside, that we test and increase our comprehension of a matter by applying it ourselves. All these things point to the fact that the expression of our ideas clarifies and renders permanent our knowledge. Moreover, knowledge is eventually of value only as expressed. Why? What other means of expression should the teacher secure besides words? How may examinations be made useful means of expression

on the part of pupils? Can a pupil express his feelings by silence?

> Summary of class discussion—possibilities in means of expression hitherto unused—need of economy of time in their use—danger of triviality—of absorption in technique—of relying on mythical influences of expression on thought.

If feelings of relationship are important elements in good thinking, if comparison is one of the chief features of rational, purposive thinking, if the associations or connections between ideas are in part the means and basis of thought, what ought the teacher to do besides arouse proper ideas? Are there any important relationships between subjects? Is it enough for a teacher of arithmetic to know arithmetic well?

> Related knowledge in teacher—in pupil—cross-references—systematic means of comparison—applications in different subjects.

9. Memory. *Briefer Course,* pp. 287-301.

In order to be fruitful, what we teach must not only be attended to, appreciated and understood, but also be made the pupil's permanent property. No apology is needed for the teacher who gives much thought to the best ways of aiding her scholars to remember. This is especially true if we bear in mind that memory is a wider function than mere verbatim knowledge, and includes permanent appreciation of the meanings of terms, of general facts and tendencies and laws. There are three common ways of memorizing, by repetition, concentration and recall. Which is the one commonly used by children? Which is the one commonly advocated by teachers? Which is the best? Why? Ebbinghaus found that it took sixteen repetitions to learn a series of twelve nonsense syllables, and fifty-five repetitions to learn a series of twenty-six. What suggestion would you get from this concerning memorizing poems, model sentences, quotations, etc.? Miss Aiken found that a poem could be best learned by learning a skeleton of the leading words, verbs, etc. What suggestion would you get from this concerning learning about a period in history or a topic in geography? Pupils often can recite a multiplication table glibly, and yet be slow and inaccurate in answering any one question, e. g., how much is 7 times 9; they often can conjugate a Latin verb through

glibly, and yet fail to translate readily any given form. What suggestion would you get from this concerning the nature of the associations to be formed in learning tables, grammatical forms, and such things? How would you apply the same facts to learning spelling? The secret of remembering things is having them associated firmly with those things in connection with which they will later be wanted. How would a systematic arrangement of subject-matter help pupils to remember it? How would cross-references help? In learning lists, the order of points of a discourse, etc., arbitrary devices of associating the different elements with other things are often helpful. Which ones have you ever used?

Summary of class discussion—criticism of mnemonic devices.

10. Imagery. *Briefer Course,* pp. 302-311; *Human Nature Club,* pp. 100-108.

The images which come up in memory may be more or less complete, faithful and lively. They are of different types, visual, auditory, etc. It has been said that one main duty of the teacher of history, geography, or literature is to make sure that pupils acquire and retain complete, faithful and vivid mental pictures of what has been described to them, that they can see, for instance, the Mississippi Valley or the advancing armies at Gettysburg spread out before their mind's eye. If the aim of the teaching is to produce in them the right reactions in the form of correct appreciations of general laws and tendencies and correct judgments, and if what James says on pages 169-170 is true, how would you criticise the view just stated?

The danger is that in pupils real appreciation of concrete things, no matter by what sort of images, will be replaced by mere memory of words or by only vague hints. We can prevent this by keeping our teaching close to reality. Would this mean that objects are always better than pictures, photographs than drawings, pictures than verbal descriptions? When we do have to resort to verbal description, useful images and true realization of the facts described will of course depend on all the factors that make a graphic style. One rule we may get from psychology. This rule will appear if we note which of the words in the following sets are the more graphic: $H_2O$ and water;

bootlicker and sycophant; reniform, kidney-shaped and bean-shaped. State the rule. From this point of view, what are the qualities of good similes and illustrations?

Supposed importance of types of imagery among children—value of work in composition to teacher—of collections of descriptive material.

So far we have sought light from psychology upon ways to secure knowledge and intellectual habits and powers on the part of pupils. What other great departments of mental life are there besides the intellect? Does the teacher need to know about them? If you think so, name any features of school work where you think knowledge about them would be useful.

11. The Emotions. *Briefer Course,* pp. 375-376; *Human Nature Club,* Chapter X.

If we accept the James-Lange theory of the emotions, what bodily attitude should we try to assume before our classes? What position should we aim to secure from children to help them in attending to a recitation? If we regarded nervousness as a crying evil among American children, what type of gait, manner of doing manual work and general style of movements should we encourage? Recall page 23 and think whether example or precept would be the better method to use in changing gait, etc.

12. The Active Side of Mental Life. *Briefer Course,* pp. 415-450; *Human Nature Club,* Chapter XI.

Teaching should aim to develop (1) the rational type of decision and (2) the power of deciding against sensuous, temporary, and personal in favor of abstract, lasting and unselfish motives. If the essential of the rational type of will is to wait till all necessary considerations are weighed, how might you encourage it in pupils? How did the old-time Puritan training develop (2)? Can you see a basis for the opinion of many people that the old rigorous and often unmeaning school training was superior to modern methods of making all school work appeal to the children's sense of what is worth while? How would you compromise between the need of training children to act from a mere "I will" in spite of discomfort and lack of personal motive and the need of interest and zest?

Would a boy learn to choose wisely if all his choices were made for him? Would he work more zealously if he were doing something he had himself chosen to do? Would he be likely to make that choice again if it turned out badly and he suffered?

Do teachers ever confuse what is really wrong with what annoys them? Does good behavior mean what is best for the boy and the school, or what is handy for the teacher? Classify common school offenses as (1) acts really dangerous to the pupil's welfare, and (2) acts unsuitable to school conditions. How should your attitudes to the two classes differ?

13. Habits. *Briefer Course,* pp. 134-150.

Make a list of the habits which school life should form in pupils; of habits in pupils which often have to be broken. How far is it true to say that everything can become to some extent an automatic habit? What is the advantage of establishing habits? What rules does James give concerning forming habits? Why would it be easier to teach a child to stop scowling by teaching him to smile rather than simply not to scowl? How would you modify the statement "Practice makes perfect" (see page 23)? Do you see any objection to asking a child to repeat when you think he has made a mistake; to letting children do the first five or ten examples under some new principle as a home task?

14. Suggestion. *Human Nature Club,* Chapter XIII; *Notes on Child Study,* pp. 110-118.

From your knowledge of ideo-motor action and suggestion, draw precepts concerning the utility of rebuking children for faults, forbidding them to do or be so and so, discussing their failings; concerning the advisability (1) of insisting that they do every bit of a piece of work, (2) of taking for granted obedience, faithfulness and successful work. State any adroit use of suggestion in teaching which you have witnessed, any common devices of handling children which depend upon suggestion. Is there any danger in enticing children into good behavior and right thoughts by suggestion instead of baldly demanding what is right? How may a teacher be misled into accepting as the result of the pupil's memory or judgment an answer which she has unconsciously suggested? Is this a common thing?

Successful use of suggestion partly a result of personality and direct experience—auto-suggestion as an explanation of self-confidence in teacher and pupil.

15. Interests.

Desired reactions of pupil include not only actual knowledge, mental ability and good conduct, but also permanent interests in attaining all these. Acquired interests grow out of instinctive—importance of interests in mental activity, ownership, emulation—interests follow knowledge and power —follow personal profit—due to infection from the teacher—interests not inconsistent with difficulty and dislike—practical precepts.

16. Mental Training.

Meaning of mental powers and mental training—special vs. general training—general training due to selection of elements common to different fields—to the selection of functions themselves of general utility—to the acquisition of ideas applicable throughout wider fields—danger of overconfidence in the value of disciplinary work—importance of showing pupils the applications of any idea or habit or power in other spheres than that in connection with which it was acquired—the great disciplinary lessons of the grade school work—samples of teaching fit to realize them.

17. Incentives and Deterrents.

So far we have in general discussed teaching as if it were a matter of indifference to the pupil whether he learned or not. But scholars who wish to learn will learn with a poor teacher or even none, and a teacher, no matter how skilful in other matters, who fails to inspire pupils with that desire will fall short of complete success. We have not only to supply a class with good opportunities but also with motives to make use of them. We have therefore to discuss incentives and deterrents or, more narrowly, rewards and punishments.

What would be an incentive to work intrinsic in the subject itself? Can we be sure that the work we think it well for children to do will be intrinsically attractive to them? What are some incentives outside the work itself? What are the incentives and deterrents commonly used by teachers? Do teachers tend to use any incentive that gets the work done? Would this ever be justifiable? Why do children so often fail to continue after they graduate the intellectual and moral activities begun in

school? What sort of incentives might change this? Why is it illogical to give extra lessons as a punishment for violation of school rules? For what would they be a logical punishment? We might agree that a rational system of incentives and deterrents would be one using those which the best people feel and give toward the different acts in question in the real world outside schools. What would be samples of such? Why would such a system tend to make school habits extend through life? Make a list of incentives and deterrents which you regard as suitable. State what sort of children each would fit best.

18. The Application of the Fundamental Law of Mind.

What is the most general law of mental life? Write a short essay or outline applying this law to the work of teaching. Consider it especially in connection with habits of attention? with apperception, the basis of rational thinking, correlation, voluntary action and habit. Lecture on same topic by instructor.

During and after the preceding work in applying psychological principles, the students spend six or more hours observing teaching in the Horace Mann School. In this observation they seek to enforce and enliven the habits of thought and the opinions they have gained by noticing actual examples. Incidentally the work familiarizes them with school life, gives them an appreciation of the personal elements that result in good teaching, and prepares them for their further work in observation, criticism and imitation of teaching in later courses. So far as possible, the observations will be made in groups of not over six students. The normal progress of the class work will be observed.

Each student is required to present a note-book containing observations illustrating the facts of the course so far, and questions suggested by the class work seen. These notes are discussed in class and returned with criticisms.

Besides applying their knowledge by actual observation, the class will make a study of ten or more lessons from text-books, some of which are printed in the following pages as samples. They will note good and bad points in these, and justify their decisions.

1. A section from a reader in geography designed for boys and girls from eleven to fourteen years old.

*A Reader in Physical Geography*, by R. E. Dodge, pp. 4-7

OUR RELATION TO THE WORLD AS A WHOLE.—The world as a whole is made up of land, water, and air; and of these the great bodies of land are the most important to us, for we live *on* and travel *over* the land, and get from it either directly or indirectly, nearly all of those materials that furnish us food, clothing and shelter...the three things that we must have in order to live. It is true that there are places in the world where men may go beneath the surface of the earth a very slight distance, in mines or in railway tunnels; but their stay as a usual thing is very short. The longest railway tunnel can be passed through in a few minutes and most miners have their homes on the surface of the earth, though they may stay several hours a day underground. Hence we can truthfully say that the vast majority of men live on the very surface of the land, and have but little to do with any other part of it. Indeed, we may almost say that man has never descended into the earth* a distance far enough to be thought of as being below the surface at all, for the deepest mine only penetrates the earth about a mile, and it is about four thousand miles to the centre of the earth.

In the same way, we have but little to do with other than the surfaces of the rivers, lakes and oceans of the world. We sail over the water of the ocean and large rivers and lakes with almost equal ease in any direction, and except in the case of deep-sea fishing, men are but little concerned in their daily life with any other parts of the waters of the world than the ever moving and ever changing surface.

When we think of the air, however, it is far different; for we live at the bottom of the atmosphere, and are related to it very much as a fish in the deep sea is related to the waters of the ocean. Occasionally men do rise into the air for a short distance in balloons, but they have not learned how to travel through the air or how to live in it, except at the bottom. The most hazardous voyages in balloons have carried men but little farther above the earth than mines go into it, and even birds that leave the solid earth, and remain poised above our heads for hours at a time, can reach but a limited height; they, like people and animals, who stay on the ground, are really at the bottom of the great ocean of air that stretches above the world for an unknown distance.

Beneath the oceans, as well as beneath the continents, are the solid rocks of the earth, that form the central core of the world—the foundation on which all else rests. This arrangement is just what we would

* The word *earth* is sometimes used to refer to the whole globe on which we live, and sometimes to the solid or rock part of that globe. It will be used in the latter sense here, and *world* will be used when we refer to the whole globe.

expect; for the solid earth is at the bottom, the liquid water is next above, and the invisible, gaseous atmosphere is over all, the three great parts of the world being thus arranged in the order of their weight. Yet these three divisions of the world are not absolutely separated, for the rocks and soils of the surface of the earth contain a great quantity of water, which, creeping along underground, feeds the roots of plants. Whenever this water appears at the surface, we have a wet place or a spring, from which water may trickle in a small stream. Every such spring or wet place is one of the beginnings of a large river; but it takes many, indeed hundreds of thousands, of such small springs to make a large river such as the Mississippi.

It is not, however, near the surface of the earth alone that water occurs in the rocks. Indeed, the deeper we go into the earth, the more water there seems to be, as any miner can tell you; for in some cases the water runs into mines so fast that large pumps have to be used night and day to keep the mine from filling. The holes and cracks in the rocks of the earth that are not full of water are full of air, so that we may say that on the land the earth, air, and water are thoroughly mingled.

In the same way we find a mingling of air and earth in the waters of the oceans, rivers, and lakes. The rock material in the water is easily seen, for most rivers, particularly after rain, are much discolored from the mud they contain. Indeed, the cleanest rain water of the heaviest storm contains rock material dissolved, as sugar may be dissolved in water that seems clear, and there is no water absolutely free from rock impurities except that which has been artificially purified in some chemical laboratory or large factory.

Passing from the water and earth to the air, we find again a mingling of materials similar to that which we have seen before. The air contains a great deal of water, which is at times invisible, but at other times perfectly visible as mist or fog. During storms some of this water or moisture falls to the earth, and runs down the slopes, making rivers that flow toward the oceans. Even after a heavy storm lasting several days, there is still a large amount of moisture left in the air, varying with the day and the part of the world. The air may be clear, apparently; but anything that absorbs moisture easily, like the wool on the back of a sheep, will feel damp to the touch, showing that moisture is present. The air in the eastern United States is most free from moisture during a clear, cold snap in winter, when the stars twinkle, and everything seems to crackle with dryness.

The particles of rock dust of a windy March day, and the dancing rays of the sunbeams as they stream across a room in a narrow path, tell us that there is rock material as well as moisture in the air. It is the dust in the air which catches the rays of light at sunset and gives us much of the beautiful color that we associate with that hour of the day. Thus we see that the three great divisions of the world we have mentioned are anything but independent and separate; indeed, the mingling is so complete that it is hard to deal with one of the three divisions without considering the others at the same time.

2. The first two pages of a general text-book on geography designed for schools and academies.

*Geography Made Easy*, pp. 1 and 2

DEFINITIONS

Geography is a Science which describes the figure, motion, magnitude, and component parts of the earth; the situations, extent and appearances of the various parts of its surface; its productions, animal and vegetable; its natural and political divisions; and the history, manners, customs, and religion of its inhabitants.

The Science which treats of the heavenly bodies, and explains their motions, magnitudes, periods, and distances is called *Astronomy*.

These two sciences are so intimately connected, that a competent knowledge of Geography is unattainable, without some previous acquaintance with Astronomy.

We shall commence this work with the following brief historical account of the origin, progress, and improvement of Geography and Astronomy.

HISTORY OF GEOGRAPHY AND ASTRONOMY

Geography, like every other science, at its beginning was very imperfect, and arrived at its present improved, though far from perfect state, by slow advances. The early geographers, being destitute of mathematical instruments, and unable to make astronomical observations began first to determine the situation of places according to climates, which they fixed from the form and color of the people and animals which were to be found in those different countries. The appearance of negroes, and of the large animals, such as the rhinoceros, and the elephant, suggested to them where to fix the limits of the torrid or burning zone. For reason, said they, points out to us, that similar animals and plants appear in the same temperature of the elements, and are produced according to the similar state of the air or climate under the same parallels, or a like situation equally distant from either pole. This was the first rude outline of Geography.

The Babylonians and Egyptians soon after adopted the method of determining the situations of places, or their distance from the equator, by observing the length of their longest and shortest day, which they determined by means of a kind of sun-dial, called a gnomon. All the places, for instance, where the longest day was just fourteen hours, or where the shortest day was ten hours, were, of course, at the same distance from the equator.

Astronomy, as a science, was first cultivated by the Egyptians, Phenicians, and Chaldeans. From them the Greeks derived their knowledge of this science.

The first of the Greeks, who laid the foundations of Astronomy, was Thales, born at Miletus, 641 years before Christ. He explained the

cause of eclipses, and predicted one. He taught that the earth was round, which before had been considered as an extensive plain, while the sun and stars moved round it. He divided the earth into five zones, discovered the solstices and equinoxes, and divided the year into 365 days. He travelled into Egypt, in quest of knowledge, and measured the height of the pyramids.

Pythagoras, the scholar of Thales, taught publicly the doctrine, common in his time, that the earth was the centre of the universe; but to his scholars, he communicated his real opinions, which were similar to those since adopted by Copernicus; that the earth and all the planets move round the sun as their centre; which doctrine he is supposed to have derived from the astronomers of India.

Philolaus, the scholar of Pythagoras, and Archytas of Tarentum, according to a passage in the works of Cicero, first taught publicly the diurnal or daily motion of the earth, and its annual or yearly motion round the sun. This passage is said to have suggested to Copernicus the first idea of that system which he established.

Democritus was the first who taught that the milky way is occasioned by the confused light of an infinity of stars, which is the doctrine still maintained by the best of philosophers. Plato and Aristotle and Eudoxus, the scholars of Plato, contributed much to the improvement of Astronomy.

3. The lesson on Paraguay from a general geography designed for the later grades of the grammar school.

*New School Geography,* pp. 246-247

PARAGUAY

Questions on map No. 28, Paraguay.—Bound Paraguay. What river on the east and south, on the west, flows through the centre? What mountains in the north? Where is Grand Island? What and where is the capital? Where is Concepción? Curuguaty? Villa Rica? Military Colony? Has Paraguay any sea-coast?

1. Position and Extent.—Paraguay lies south and west of Brazil, and is included principally between the Paraná and Vermejo Rivers. Greatest length, about 650 miles; breadth, about 400. Area, 190,000 sq. miles,—nearly equal to that of the State of California.

2. Natural Features.—Mountains.—A range of the Brazilian mountains extends through the eastern part. On each side of the mountains are fertile plains, upon which horses and cattle roam in great numbers. The Gran Chaco, mainly a desert region, lies west of the Paraguay River.

3. Soil and Climate.—The soil is very fertile. The climate varies according to elevation as one passes from the lower country to the mountains. In general it is mild and healthy.

4. Rivers.—The Paraguay and Paraná are the principal rivers. On

the Paraná River are several magnificent waterfalls; one stretch of a hundred miles is a continuous series of rapids.

5. Products.—The vegetable products of Paraguay are of great variety, and include many valuable woods and gums. Hides are largely exported. Yerba Mate (mah-tay), or Paraguay tea, is used instead of the tea of China. The animals and minerals are like those of the adjacent provinces of Brazil.

6. Population.—The population is 1,337,000. It consists chiefly of Indians, a few whites and the mixed breeds.

7. Chief towns.—Asuncion (ah-soon-se-own′), the capital on the left bank of the Paraguay, is a neat and cleanly city. It is situated nearly opposite the junction of the Paraguay and Pilcomayo Rivers, 1000 miles from the sea. Concepción (kon-sep-se-own′), in the north, Curuguaty (koo-roo-gwah′-te), near the centre, and Villa Rica (veel′-yah re′kah), south of the centre, are the other principal towns.

8. Government.—Paraguay formerly included all the territory between latitude 16° south and the Straits of Magellan, and between Brazil on the east and Chili and Peru on the west; but revolts and cessions reduced it to the small strip between the Paraná and Paraguay Rivers. It has lately extended its borders westward to the Vermejo.

9. This State declared its independence in 1810. In 1812, Dr. Francia, a native Creole, ursurped the government, made himself dictator, and ruled, from 1812 to 1840, with a vigorous hand. Some years after the death of Francia, Antonio Lopez became President. The government is a republic only in name. The people are better educated than those of the adjacent States. A good school system was organized by the Dictator Francia.

10. Religion.—The Roman Catholic religion is established. Since the edict of toleration issued by Lopez in 1846, other denominations have been tolerated, but they are not permitted to erect places of worship.

11. In the early part of the eighteenth century, the Jesuit missions of Paraguay included 100,000 Indian converts, who were taught reading, writing, a few of the simplest trades, and the use of arms. In 1759, the Spanish government, jealous of the intentions of the Jesuits, banished the teachers and broke up the missions.

4. A short section from the beginning of a text-book in English for beginners, presumably children in the second or third or fourth year of school life.

*The Mother Tongue,* pp. 4 (last paragraph) and 5

You have enjoyed reading "Hiawatha" and "The Village Blacksmith," which Mr. Longfellow wrote for you. When he was a little boy, living in Portland, Maine, his father went to Boston, many miles away. He wished to tell his father something; but of course he could not talk to him. So he wrote a letter to tell what he wanted. Here is the letter.

When you look at it, you will see that his father could understand the boy's thoughts and wishes by reading the written words quite as well as if they had been talking together.

PORTLAND, January, 1814.

DEAR PAPA, — Ann wants a Bible like little Betsy's. Will you please buy her one if you can find any in Boston?

I have been to school all the week, and got only seven marks. I shall have a billet on Monday.

I wish you to buy me a drum. H. W. L.

Could you have done so well?

When Mr. Longfellow was a boy, he knew how to express his thoughts in writing. His letter tells you just what he wanted. When he became a man, he expressed his thoughts so well that everybody was glad to read them. He used the same language which you use, but he used it better than you can. He knew far more about it than you do, just as travelers who have seen the rivers of ice in the north and the tangled forests of the south, know more of the earth than men who have always stayed at home.

There is a right way of doing everything, as well as several wrong ways. There is a right way to spin a top, to set a table, to harness a horse, to write a letter, to express a thought. This book will help you *to speak and write correctly*, and to choose words which will express just what you desire to say. That is, it will help you to make an intelligent use of your mother tongue.

5. Selections from the opening chapters on elocution of a reader for "children from seven to twelve years of age."

*The Independent Fourth Reader*, pp. 13-20 (page 13 is the beginning of the text).

Page 13.

Elocution is the mode of utterance or delivery of anything spoken. It may be *good* or *bad*.

*Good* elocution, in reading or speaking, is uttering ideas understandingly, correctly, and effectively. It embraces the two general divisions, ORTHOEPY and EXPRESSION.

Elocution { Orthoepy / Expression

ORTHOEPY

ORTHOEPY is the art of correct pronunciation.

It embraces ARTICULATION, SYLLABICATION, and ACCENT.

Page 17.

III

COGNATES

First require the student to pronounce distinctly the word containing the atonic element, then the subtonic cognate, uttering the element after each word — thus: li*p*, *p*; or*b*, *b*, etc. The attention of the pupil should be called to the fact that cognates are produced by the same organs, in a similar manner, and only differ in one being an undertone, and the other a whisper.

After more definitions and instructions like these and some exercises in pronouncing the vowels and consonants we find the following lesson:

Page 19.

V

ORAL ELEMENTS COMBINED

After the instructor has given a class thorough drill on the preceding tables as arranged, the following exercises will be found of great value, to improve the organs of speech and the voice, as well as to familiarize the student with different combinations of sounds.

As the *fifth* element represented by *a*, and the *third* element of *e*, are always immediately followed by the oral element of *r* in words, the *r* is introduced in like manner in these exercises. Since the *sixth* sound of *a*, when not a syllable by itself, is always immediately followed by the oral element of *f*, *n*, or *s*, in words, these letters are here employed in the same manner.

TONICS AND SUBTONICS

| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1. | ba | ba | ba | ba | bar | baf | be | be | ber |
| | 1 | 2 | 1 | 2 | 3 | 2 | 3 | 3 | |
| | ib | ib | ob | ob | ob | ub | ub | ub | oub |
| | 1 | 2 | 3 | 4 | 5 | 6 | 2 | 2 | 3 |
| | da | da | da | da | dar | das | de | de | der |
| | 1 | 2 | 1 | 2 | 3 | 2 | 3 | 3 | |
| | id | id | od | od | od | ud | ud | ud | oud |
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| | ga | ga | ga | ga | gar | gan | ge | ge | ger |
| | 1 | 2 | 1 | 2 | 3 | 1 | 2 | 3 | |
| | ig | ig | og | og | og | ug | ug | ug | oug |

(Seven similar tables follow.)

6. The first lessons in arithmetic from *Arithmetic on the Productive System*, by R. C. Smith.

ARITHMETIC[1]

Part First:

Being a mental[2] course for every class of Learners

NUMERATION[3]

Recite by the questions

1. Number, which shows how many are meant, is represented[4] by letters, by words, and by characters[5] called figures, as: —

| | | | | | |
|---|---|---|---|---|---|
| One | I | 1 | One hundred | C | 100 |
| Two | II | 2 | Two hundred | CC | 200 |
| Three | III | 3 | Three hundred | CCC | 300 |
| Four | IV* | 4 | Four hundred | CCCC | 400 |
| Five | V | 5 | Five hundred | D or IↃ† | 500 |
| Six | VI | 6 | Six hundred | DC or IↃC | 600 |
| Seven | VII | 7 | Seven hundred | DCC or IↃCC | 700 |
| Eight | VIII | 8 | Eight hundred | DCCC or IↃCCC | 800 |
| Nine | IX* | 9 | Nine hundred | DCCCC or IↃCCCC | 900 |
| Ten | X | 10 | One thousand | M or CIↃ | 1000 |
| Eleven | XI | 11 | Two thousand | $\overline{\text{II}}$ or MM | 2000 |
| Twelve | XII | 12 | Three thousand | $\overline{\text{III}}$ or MMM | 3000 |
| Thirteen | XIII | 13 | Four thousand | $\overline{\text{IV}}$ or MMMM | 4000 |
| Fourteen | XIV | 14 | Five thousand | $\overline{\text{V}}$ or IↃↃ | 5000 |
| Fifteen | XV | 15 | Six thousand | $\overline{\text{VI}}$ or IↃↃM | 6000 |
| Sixteen | XVI | 16 | Seven thousand | $\overline{\text{VII}}$ or IↃↃMM | 7000 |
| Twenty | XX | 20 | Eight thousand | $\overline{\text{VIII}}$ or IↃↃMMM | 8000 |
| Thirty | XXX | 30 | Nine thousand | $\overline{\text{IX}}$ or IↃↃMMMM | 9000 |
| Forty | XL* | 40 | Ten thousand | $\overline{\text{X}}$ or CCIↃↃ | 10000 |

. . . . . .

* Or, IIII for 4; VIIII for 9; XXXX for 40: LXXXX for 90; and CM for 900.

† Every Ↄ annexed to IↃ increases its value 10 times; as IↃ, is 500, IↃↃ is 5000. In like manner the prefixing of C and annexing of Ↄ to CIↃ increases it 10 times, as CIↃ, 1000, CCIↃↃ, 10000; lastly a line over any number increases it 1000 times; as D, 500, $\overline{\text{D}}$, 500000.

. . . . . .

NOTE. — L. stands for the Latin language; G. for the Greek, and F. for the French.

[1] Arithmetic (G. *arithmetiké*), Computing, calculating or reckoning by numbers.

[2] Mental (L. *mentis*), Pertaining to the mind; intellectually.

[3] Numeration (L. *numeratio*), Numbering; the method or act of numbering.

[4] Represented, Exhibited; described; personated; to supply the place of.

[5] Character, A mark; a stamp; a letter; reputation; a personage.

| | | | | | |
|---|---|---|---|---|---|
| Fifty | L | 50 | Twenty thousand | $\overline{XX}$ or CCIↃↃCCIↃↃ | 20000 |
| Sixty | LX | 60 | Fifty thousand | $\overline{L}$ or IↃↃↃ | 50000 |
| Seventy | LXX | 70 | One hundred thousand | $\overline{C}$ or CCCIↃↃↃ | 100000 |
| Eighty | LXXX | 80 | Five hundred thousand | $\overline{D}$ or IↃↃↃↃ | 500000 |
| Ninety | XC* | 90 | One million | $\overline{M}$ or CCCCIↃↃↃↃ | 1000000 |

*Questions on the Foregoing*

2. What does Number show? 1. How is it represented? 1. What letters and what figures stand for one, four, five and nine? What for ten? Ans. The figure 1 and 0 called naught or cipher.

3. What letters and what figures stand for eleven? For twelve? Fifteen? Twenty? Forty? Fifty? What different numbers may be represented by the figures 1 and 5 written together? Ans. Fifteen and fifty-one; as, 15, 51.

4. What different numbers may be expressed by the figures 1 and 9? 2 and 5? What number is expressed by C? by D? by M? What by C, D, M, with a dash over each?

5. What figures stand for one hundred? For two hundred? One thousand? Ten thousand? One hundred thousand? One million?

## 7. *Mental Arithmetic;* Thomson (designed for beginning students in primary departments).

*Lesson 1*

To Teachers. — The following Lessons assume that the class have an imperfect knowledge of *counting,* and of *elementary numbers.* The object is to show them practically *how many things* each number expresses, and impart to them a *distinct idea* of *more* and *less.*

1. How many of these little girls and boys can count? All who can, may hold up a hand.

2. The teacher puts down a counter,[1] as a book, and asks, "How many books are here?" The class answer "One book." Putting down another, "How many now?" "Two books." Putting down another, "How many now?" "Three books."

3. Hand me one book. Hand me two books. Hand me three books.

4. Each show me one finger. Show me two fingers. Three fingers. Four fingers. Five fingers.

[1] The teacher is supposed to be furnished with a Blackboard, a Numeral Frame, and a box of Counters; the pupils with small slates and pencils. For "counters," he may use any convenient portable objects; as, pebbles, bits of paper, pencils, cents, etc. Blocks of one, two or three cubes, and so on, up to a block of ten cubes, distinctly marked upon it, are also valuable aids.

5. When you say, one, two, three, four, five, etc., what is it called? Ans. Counting.

6. Again, putting down three books and then another, the teacher asks, "How many now?" "Four books." Putting down another, "How many?" "Five books."

7. The first child may hand me "one book." The next, "three books." The next, "two books." The next, "four books." The next, "five books."

8. Each hold up two fingers. Four fingers. Three fingers. Five fingers.

The thumbs are often regarded as fingers, and in counting may be so considered by the class.

9. Make two straight marks upon your slate; now make another beside these and count them.

10. Make one more beside these and count them.

11. Make one more and count them all.

12. What number comes after one? (The class answer in concert.) What comes after two? What after three? After four?

13. Two comes after what? Three after what? Four after what? Five after what?

14. What comes before five? What before four? Before three? Before two? Before one?

15. Count from one to five in concert.

16. Count from five to one backward in concert.

17. How many of the class can express the numbers, one, two, three, four, five, by figures?

18. Make the figure 1 (one) upon your slates (the teacher writing it upon the blackboard).

19. Make the figure 2 (two). The figure 3 (three). The figure 4 (four). The figure 5 (five). Make each of these figures twice more.

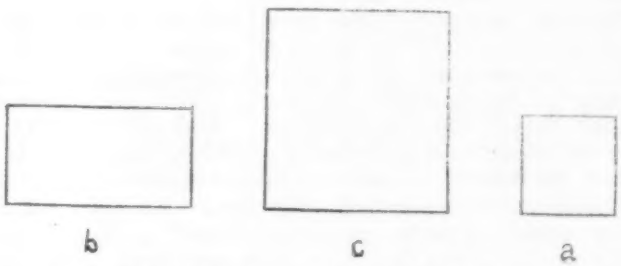
8. A selection from *Speer's Elementary Arithmetic.* The quotation from the introduction shows what may be expected of the pupils for whom the lesson is designed. The lesson is the first of their second year's work.

*Introduction*

Normal State of the Pupil. If the work of the first year has been rightly carried on there will be a tendency to look at things, to handle them, to compare them, and to express freely what is discovered. Continued growth requires continued fostering of this disposition. The mind that is not exercised in observing and comparing loses power to picture

conditions, to see things as they are. Growing power to judge involves continued sensing, imaging, and expressing.

PART I




*Ratios.* — 1. Tell what you can about *a*, *b* and *c*.

2. *b* equals how many times *a*? *c* equals how many times *b*? *c* equals how many times *a*?

3. *a* equals what part of *b*? What part of *c* equals *a*?

4. If *a* is 1, what is *b*? what is *c*?

5. If *c* is 1, *b* equals what part of 1?

6. If *c* is worth 40 cents, what part of 40 cents is each of the others worth? If *a* is worth 10 cents, how many 10 cents is each of the others worth?

7. If the length of *a* is 1, what is the length of *b*? of *c*? What is the width of *b*?

8. Show me the square whose length is 1; the square whose length is 2. The square of 1 equals what part of the square of 2?

9. Draw a line and call it 1; draw the line 2. Draw the square of the 1; of the 2. The square of the 1 equals what part of the square of 2?

10. Draw a line six inches long on the blackboard and call it 1; draw 2. Draw the square of the 1 and of the 2 Compare the squares.

11. Cut a square of 1 and a square of 2. Compare.

12. Draw the rectangles *a*, *b*, *c* on the blackboard, making *a* 6 in. long. Review.

13. Draw rectangles again, making *a* 1 ft. long and *b* and *c* 2 ft. long. Review.

9. A selection from Peabody's *Chronological History of the United States* for the use of schools. Four pages of narrative are given to be studied, and then the teacher is to put the following questions:

SPANISH ADVENTURERS

Who was Ponce de Leon? Where is to be found an account of his adventures? What was he doing when he discovered Florida? Why did he name it Florida? How did Charles the Fifth reward him for his discovery? What became of him?

What was Vasquez de Ayllon about, when he discovered Chicora? What do we call Chicora? How did he succeed in his undertaking? How was he rewarded for this cruel act? What was his success and fate?

Where had Stephen Gomez been in 1519? What did he undertake to do in 1525? What harbors did he explore? What cruel thing did he do, when he was disappointed of finding the northwest passage to India?

When did Narvaez attempt to conquer Florida? How many men had he? How did the Indians act? How many miles, and where did the Spaniards ramble? What became of them at last?

Who was Ferdinand de Soto? How came he to be appointed to conquer Florida? What were the preparations? What was his first act when he landed? How did the natives manage? Where did the party go? How did they act toward the natives? What discoveries did the Spaniards make? What became of de Soto? When did he die? Where was he buried?

What was the cause of Melendez being sent to conquer Florida? Who was Melendez? How was he induced to go and fitted out? Why did he so name St. Augustine? How did he announce himself to the French? What did he do first on landing? How did he find the French fort? How did he act? To what then does St. Augustine owe its origin? How much older is it than any other city in the United States? Was Melendez' cruelty punished? How long was it from Ponce de Leon's discovery to the founding of St. Augustine? What happened in 1512? 1520? 1525? 1526? 1537? 1542? 1565? Why is the red put in the eighth subdivision of the representation of these years? Why in the fifth subdivision of 1565? Why in the upper triangle of the second subdivision? What does the orange color mean?

Further practical work will consist of answering some fifty or more practical problems taken from actual school practice, such as the following:

What would you do for a class of students who had difficulty in distinguishing past from passive? Why?

How would you advise students to learn a vocabulary in French? Why?

Why is it so hard for children to answer in complete sentences to such questions as "When did Abraham Lincoln die?"

Supposing the custom of extorting complete sentences from children whenever they speak to be desirable, how could you make it less unnatural?

A girl constantly misspelled *to*, *too*, and *two*. How would you try to cure her?

A teacher gave children some flowers to classify with the expectation that they would put those together which had similar structures. Many of the children classified them by their color. To what was their mistake due? What do you think would have been the best way of avoiding it?

The next division of the work of the course comprises the study of two texts, Fitch's *Lectures on Teaching,* a general manual of wholesome advice, and McMurry's *Method of the Recitation,* a presentation of the so-called "formal steps." This work is accompanied by one to three hours a week of observation in the Horace Mann School. The aim of this division of the observation work is the intelligent study of the methods used by the teacher from the teacher's point of view. To secure this sympathetic study, the observation periods will be so arranged that a reasonably complete and continuous study of some feature of the teacher's work will result. As in the other observation work, the students will be divided into groups of six. The co-operation of the teachers of the School is relied on to make this observation work an intelligent study of the normal life of the school room under the direction and from the point of view of those who know it intimately, the teachers themselves.

Further practical work will consist of plans for class lessons, demonstrations, home-work, reviews, etc. The student will be required to plan each of these to fit some definite class in some definite school. It is expected that some if not all of these will receive criticism and correction from the officers of special departments and the critic teachers of the School, as well as from the instructor in charge. Finally each student is required as part of the work of the course to present a scrap-book of notes, references, quotations, diagrams, illustrations, etc., classified according to school subjects and maturity of scholars, collections of use in teaching science, history, etc., etc. The aim of this work is to form in students the habit of thinking of schoolroom needs, of making their general reading and experience contribute to the enrichment of the courses of study they administer and of choosing material relevant to actual school work and suited to children of different ages.

The last division of the course will be occupied with lectures and discussions concerning the elements of personality which are characteristic of good teachers, and the possibility and methods of cultivating them. The aim will be to direct students to profitable ways of increasing their professional efficiency by the criticism of personal traits. The topics will be the following:

> Personality not an utter mystery — changes in personal make-up occur — to some extent are within our power. — The desirable elements in personality in the case of the teacher. Orderly, ready, related knowledge — value of the study of composition and of masterpieces of exposition — of practice in quick use of the knowledge at one's command — of the study of the relationships of any body of knowledge taught to the rest of knowledge. Clearness and vigor in extemporaneous speech — value of all rhetorical practice. Posture, voice, dress, freedom from eccentricities. Ready and accurate observation of children's acts, moods, desires, feelings, etc. — of the idea behind the words — value of living with children, of trying to make such observations and testing one's guesses. Liking for children — value of treating them as if one did like them — doing things for them, etc. Common sense — equivalent to the absence of bizarre notions, sentimentality, a doctrinaire temper, and the presence of some power of humor and self-criticism and of appreciation for the golden mean in things — partially acquirable — value of much intercourse with all classes of people, abandonment of hobbies, systematic practice in doing as others do, making fun of one's self, seeking and destroying one's extravagances and petty peculiarities. Personal magnetism — equivalent in part to self-confidence, enthusiasm, erect posture, looking people in the eye, mastery of a multitude of devices for suggestion. Value of saving time by not worrying, doubting or wondering about success or failure — of accepting every activity proposed, of doing new things whenever the chance arises.

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3. THE SCHOOL OF MINES, established in 1864, offers courses of study, each of four years, leading to a professional degree in mining engineering and in metallurgy.

4. THE SCHOOLS OF CHEMISTRY, ENGINEERING, AND ARCHITECTURE, set off from the School of Mines in 1896, offer respectively, courses of study, each of four years, leading to an appropriate professional degree, in analytical and applied chemistry; in civil, sanitary, electrical, and mechanical engineering; and in architecture.

5. TEACHERS COLLEGE, founded in 1888 and chartered in 1889, was included in the university in 1898. It offers the following courses of study: (*a*) graduate courses leading to the higher diploma or to the secondary diploma; (*b*) professional courses, each of two years, leading to diplomas for teachers and supervisors in kindergartens or elementary schools, or for specialists in Domestic Art, Domestic Science, Fine Arts, Music, and Manual Training; (*c*) a collegiate course of two years, which, if followed by a two years' professional course, leads to the degree of Bachelor of Science. Certain of its courses may be taken, without extra charge, by students of the university in partial fulfilment of the requirements for the degrees of Bachelor of Arts, Master of Arts, and Doctor of Philosophy.

SETH LOW, LL.D., President.

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